SEMESTER END EXAMINATION APRIL-MAY, 2026

Course Name:-MCA **Semester:-II**

Paper Name:-Theory Of Automata& Formal Language Paper Code:-MCA-021

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-75**

Instructions:

- **The question paper consists of three sections A, B, and C. All sections are compulsory.**
- **Section A: Each question carries 1 mark.**
- **Section B: Answer any 4 out of 6 questions.**
- **Section C: Answer any 2 out of 3 questions.**

Section – A
Objective Questions

1. All questions are compulsory. **1×15=15**

a Multiple choice Questions.

i. A language is regular if and only if
   a) Accepted by DFA
   b) Accepted by PDA
   c) Accepted by LBA
   d) Accepted by Turing machine

ii. The instantaneous PDA is following elements:
   a) State
   b) Unconsumed input
   c) Stack content
   d) All the above

iii. PDA consists of:
   a) Stack
   b) Queue
   c) Array
   d) None

iv. The regular expression (0+1)* represents:
   a) All binary strings
   b) Only 0
   c) Only 1
   d) Empty

v. Which operation is NOT closed for regular languages?
   a) Union
   b) Intersection
   c) Complement
   d) None (All are closed)

b True or False

I. Regular languages are accepted by DFA.
II. DFA can have ε-transitions.
III. Turing machine has infinite memory.
IV. Halting problem is decidable.
V. Moore machine output depends on state only.

c Fill In The Blanks.

I. NFA can have _____ transitions for same input.
II. Type-1 grammar is _____.
III. Φ belongs to_____ language.
IV. Recursive Enumerable Language is accepted by_____.

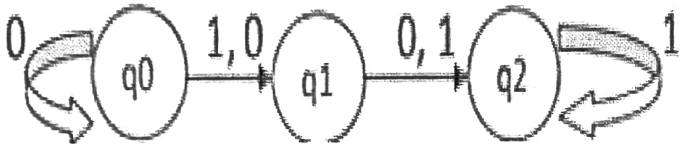
V. Turing machine recognizes _____ languages.

Section – B
Short Answer Questions

2. Answer any four of the following questions. **7×4=28**

1) Explain NFA with ε moves with the help of example . Differentiate the + closure and * closure with the help of example.
2) Difference between DFA and NFA.Construct DFA and its complement over {0,1} which accept string which start and ends with same number.
3) Explain **regular expressions** with examples. Construct r.e for **'aa'** as a substring.(Σ = {a,b})
4) Explain CFL and CFG with help of example.Classify some closure properties of CFL?
5) State and prove Kleen's theorem with suitable example.
6) i)Construct DFA and its complement over (0,1)which accept **even number of '0' and even number of '1'**

ii)Convert the following NFA to equivalent DFA



Section – C
Descriptive Questions

3. Answer any two of the following question. **16×2=32**

1) What is DFA minimization? Explain why it is needed.

Draw a minimized DFA:

Start state:p

Σ = {0,1}

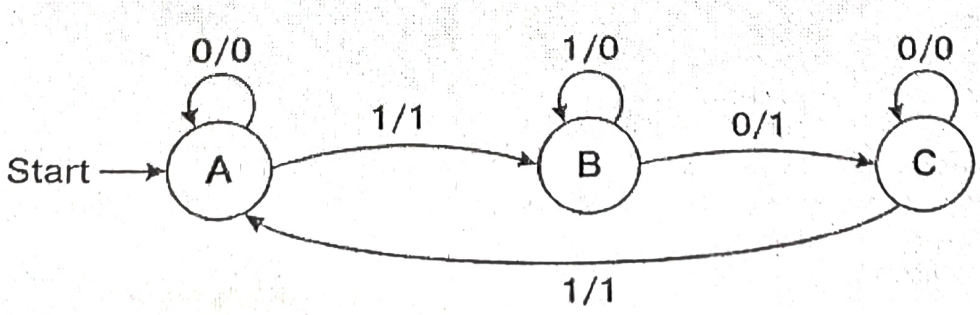
States: {p,q,r,s,t}

Final states: {s,t}

State	0	1
p	q	r
q	p	s
r	t	p
s	s	t
t	t	t

2) Differentiate between mealy and moore machine.

Convert this moore machine into equivalent mealy machine. Draw automata after conversion.**(start state: 'A')**



3) Explain Turing Machine and language accepted by it?. Elaborate halting problem?Explain why turing machine is more powerful than DFA and PDA.